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Wagner Free Institute of Science

of Philadelphia

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Annual Announcement

1912-13

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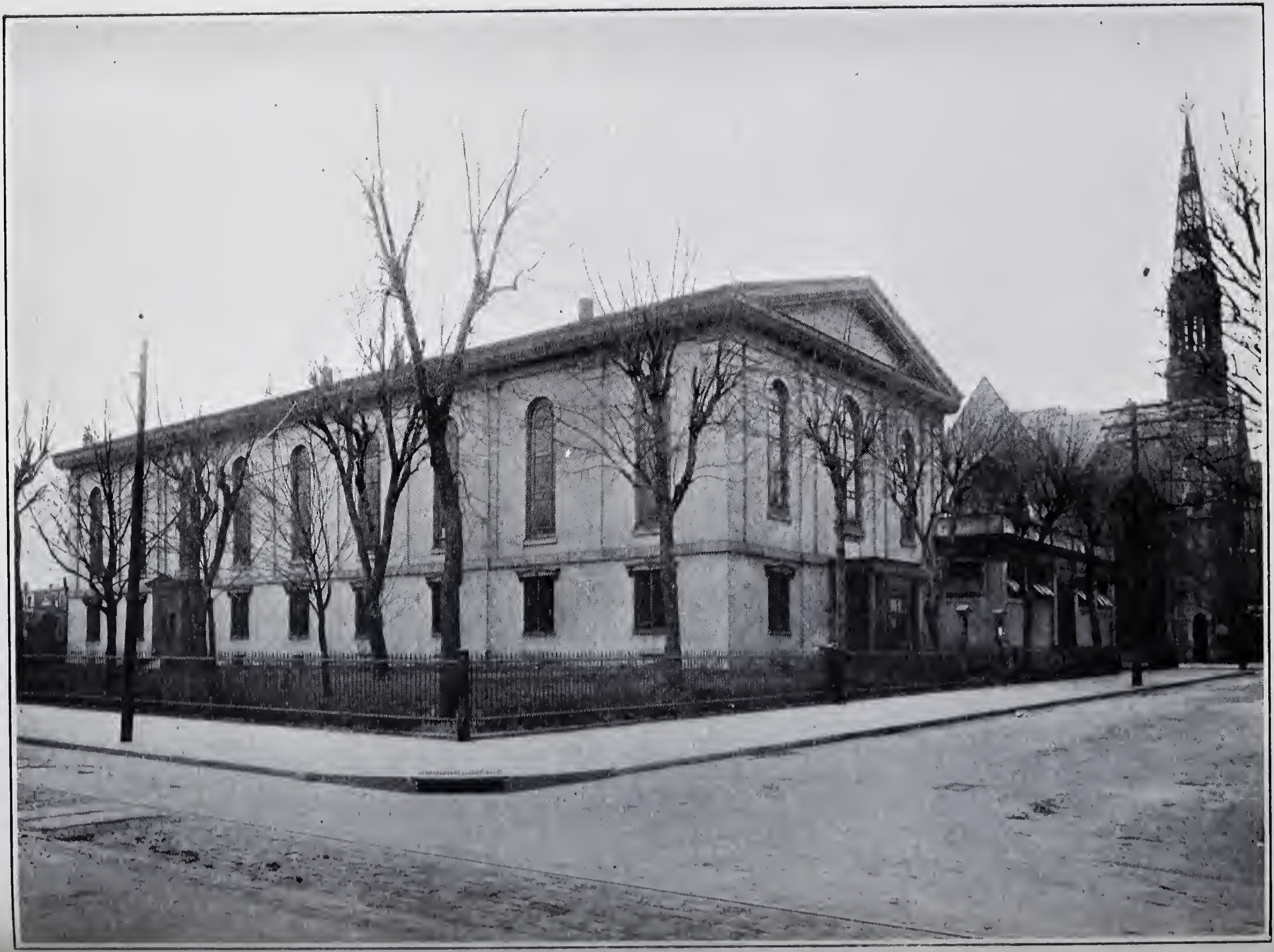


Hall of the Wagner Free Institute of Science

Wagner
Free Institute of Science
of Philadelphia

ANNUAL
ANNOUNCEMENT

Sixty-Fifth Year

Philadelphia
1912

TRUSTEES.

President, Samuel Wagner.
Secretary, Joseph Willcox.
Treasurer, J. Vaughan Merrick.
Sydney T. Skidmore.
Samuel T. Wagner.
Harrison S. Morris.
Henry Leffmann.

FACULTY.

William Healey Dall, A.M., Sc.D.
Honorary Professor of Invertebrate Paleontology.

Henry Leffmann, A.M., M.D., Ph.D.
Honorary Professor of Chemistry.

William B. Scott, A.M., Ph.D., LL.D.
Honorary Professor of Geology.

George F. Stradling, Ph.D.
Honorary Professor of Physics.

Samuel Tobias Wagner, B.S., C.E.
Professor of Engineering.

Spencer Trotter, M.D.
Professor of Zoölogy.

Samuel C. Schmucker, Ph.D.
Professor of Botany.

Leslie B. Seely, B.A.
Professor of Physics.

Charles H. LaWall, Ph.M.
Professor of Organic Chemistry.

David W. Horn, Ph.D.
Professor of Physical Chemistry.

Edgar T. Wherry, B.S., Ph.D.
Lecturer on Geology.

John G. Rothermel, *Superintendent.*

HISTORICAL NOTE.

The Wagner Free Institute of Science owes its establishment to the liberality and public spirit of William Wagner and his wife Louisa Binney Wagner. In his early life Professor Wagner made extensive voyages in the service of Stephen Girard, and had opportunities to visit scientific institutions and make the acquaintance of scientific workers. He soon developed a strong interest in the natural sciences, especially geology and mineralogy, and devoted a large part of his life to studying these topics and collecting material to illustrate the teaching of them.

In 1847 he began to give free lectures at his home, near the present location of the Institute building, at that time in the rural section of the county. In 1855 the Institute was incorporated by the Legislature, a faculty was appointed and lectures were given at Commissioners' Hall, Thirteenth and Spring Garden Streets, by permission of the city authorities.

In a few years the city was obliged, by its own needs, to withdraw the privilege of the hall, and Professor Wagner arranged to erect a suitable building on his own property. This was completed in May, 1865, and lectures at once given in it. In 1864 a deed of trust was executed by Professor Wagner and his wife, furnishing a permanent endowment of the Institute.

In 1885, by the death of the founder, the care of the Institute passed entirely into the hands of a Board of Trustees, and since then many improvements have been made in the building, and extensive additions to its equipment in the museum and library and in scientific apparatus. In 1901 a wing was built for the use of a branch of the Free Library of Philadelphia.

The lecture-room is capable of seating about six hundred persons and is equipped with excellent lecture facilities. The collection of physical apparatus comprises many of the older forms which have historic interest and a large number of the most recent invention and construction.

FACILITIES FOR INSTRUCTION.

Lectures and Class-work.

Instruction at the Wagner Free Institute of Science is conducted by means of public lectures, supplemented by class-work, and is without charge and without restriction of race or sex. The class-instruction is given partly at the close of each lecture, partly by written exercises. The museum and reference library of the Institute are available for aid in the instruction work and are freely used. In addition the Wagner Free Institute Branch of the Free Library of Philadelphia affords abundant opportunities for collateral reading.

At the close of each course of lectures an examination is held, to which those who have attended the classes are admitted, and on passing such examination the pupil is awarded a certificate. Certificates are awarded at a public meeting held in May of each year.

The lecture courses are arranged to cover a given topic in four successive years, and to those who hold certificates for each of these courses, a full-term certificate is issued.

Holders of full-term certificates are eligible to membership in the Alumni Association. For information in regard to this see page 8.

Museum and Libraries.

The Museum covers the whole field of natural science and contains illustrations of all departments of biology, geology, mineralogy, metallurgy and engineering. The specimens are arranged so as to be easily studied and are open to inspection from 2 to 5 o'clock Wednesday and Saturday afternoons, except legal holidays.

The reference library contains text-books and works of reference in all departments of science, encyclopedias, many works devoted to literature and an assortment of dictionaries of English, classical and foreign languages. It is open on all regular business days from 9 a. m. to 9.30 p. m., a librarian being always in attendance to assist students.

The circulating library is a branch of the Free Library of Philadelphia. It is open every business day from 9 a. m. to 9 p. m. Books may be taken out under the usual rules of the Free Library. Many periodicals—American and foreign, scientific and literary—are on file.

ACCESSORY SCIENTIFIC WORK.

Two scientific societies meet regularly at the Institute. The Philadelphia Natural History Society meets on the third Thursday of each month except June, July and August, and the Philadelphia Mineralogical Club on the second Tuesday of each month except July and August. These meetings are open to all persons.

The Alumni Association holds a public meeting on the third Tuesday in January of each year.

UNIVERSITY EXTENSION LECTURES.

Courses of lectures under the auspices of the American Society for the Extension of University Teaching and The Free Library of Philadelphia are given regularly in the hall of the Institute, and are open to all without charge. These courses embrace a wide range of topics, being usually outside of the scope of the regular Institute courses.

SCHOOL CHILDREN LECTURES.

Under the auspices of the Free Library of Philadelphia illustrated lectures are given to school children on Tuesday afternoons during the winter season. These are elementary and relate to travel, science, history and biography. Small classes of children are also given brief instruction in a "Story Hour."

SPECIAL LECTURES.

By the liberality of Richard Brodhead Westbrook, D.D., for many years a trustee of the Institute, and his wife, Henrietta Payne Westbrook, provision has been made for lectures independent of the general courses of the Institute and covering a wide range of topics.

The first course under this endowment consisted of five lectures on "The Ancient Civilization of Babylonia and Assyria," by Morris Jastrow, Jr., Ph.D., Professor of Semitic

Languages in the University of Pennsylvania. Arrangements are being made for the publication of these lectures in book form.

The course for the session of 1912–13 will be upon the Conservation of Natural Resources.

RESEARCH.

The Institute has maintained research work since 1885, and has published six complete volumes of transactions and the first part of a seventh volume. A list of the subjects will be found on page 23. In addition, the income of a special fund is available for lectures and research in chemistry.

ALUMNI ASSOCIATION.

The Alumni Association was organized in 1907, composed of those who have received degrees or full-term certificates of the Institute.

The officers for 1912 are:

President, Henry Leffmann.
Vice-Presidents, Daniel G. Alrich, Edward W. Siegmann.
Secretary, Edgar T. Wherry.
Treasurer, W. C. Hambel.
Advisory Council, P. Caledon Cameron, William J. Reinhold, Maximilian Weiss, and the above-named officers.

The Association holds a meeting in January of each year, which is preceded by a public meeting at which a lecture on some scientific topic is given.

At the annual meeting of 1912 an illustrated lecture on "A Thunderstorm as Seen by a Photographer" was delivered by John M. Justice.

CLOSING EXERCISES.

In May of each year the courses of instruction are formally closed by a public meeting at which addresses are given and the certificates awarded.

At the closing exercises in May, 1912, after an address by Professor Henry Leffmann, President of the Faculty, and awarding of certificates, Professor John A. Miller, of Swarthmore College, delivered an illustrated lecture on "Our Present Knowledge of the Sun."

The following is a list of those receiving certificates on this occasion:

FULL-TERM CERTIFICATES

Physics, Spencer Manning Gowdy
Botany, A. M. Bean, Sarah E. Levis, Elizabeth Kirk
Chemistry, Leland Valentine

1911-1912 CERTIFICATES

ENGINEERING 1.

Alfred C. Bauer
George L. Collinson
Frederic Goodwin Kennedy
Raymond H. Krecker
William Henry Pahl
George H. Seitz
William Brink
William George Dukek
William Knabe
Lewis D. B. Scheuerle
John Charles Deans Taylor
William Albert Taylor

ZOÖLOGY 1.

P. C. Cameron
Mae L. Howard
Sarah E. Fisher
Elizabeth Kirk

INORGANIC CHEMISTRY 4.

W. J. M. Devine
Frederic Goodwin Kennedy
William Knabe
Leland Valentine

ORGANIC CHEMISTRY 3.

W. J. M. Devine
Frederic Goodwin Kennedy
William Knabe
Leland Valentine

BOTANY 1.

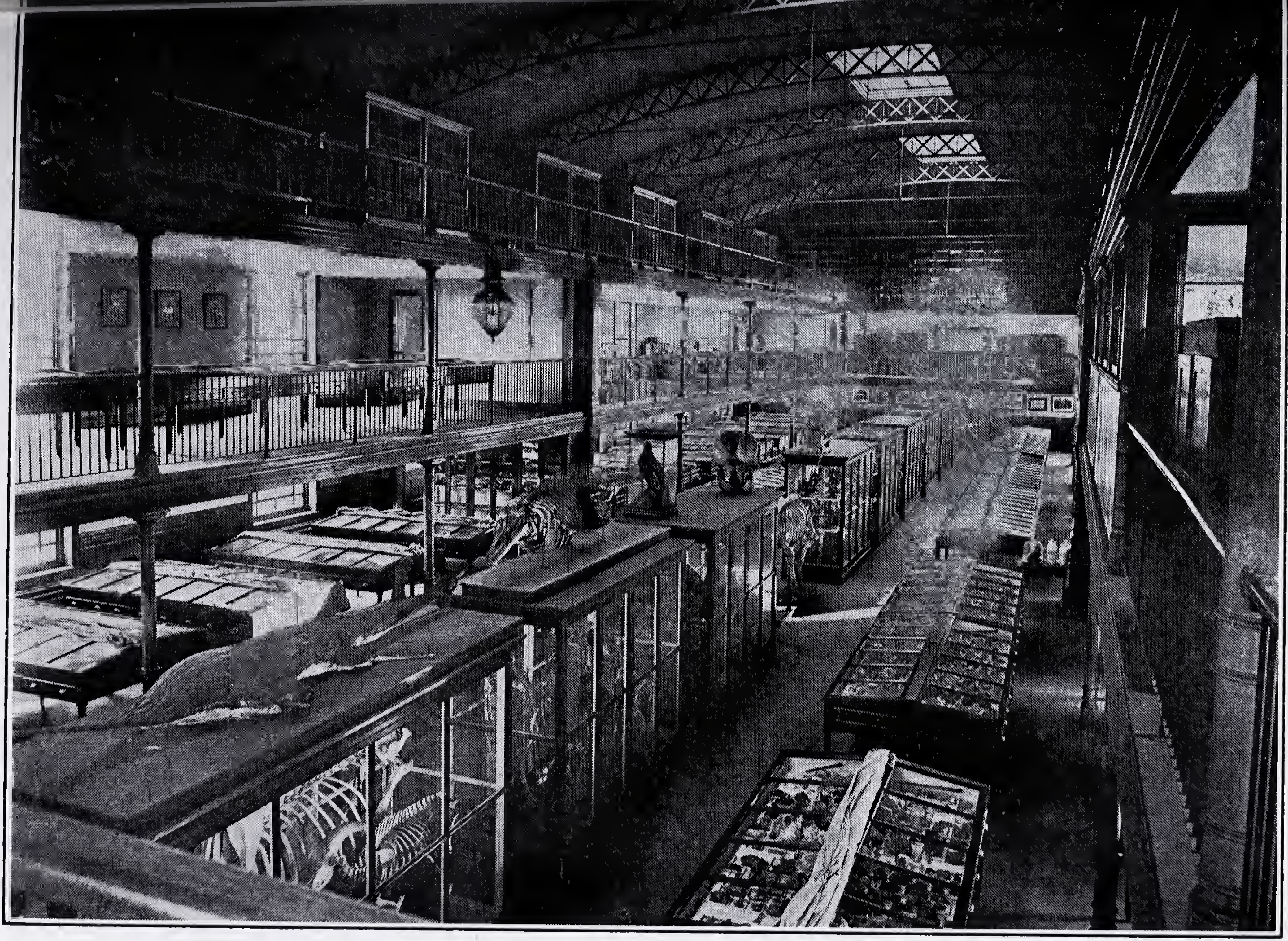
A. M. Bean
Herbert Haas
William Knabe
Sarah E. Fisher
Leila S. Jones
Samuel G. Gordon
Elizabeth Kirk
Sarah E. Levis

PHYSICS 2.

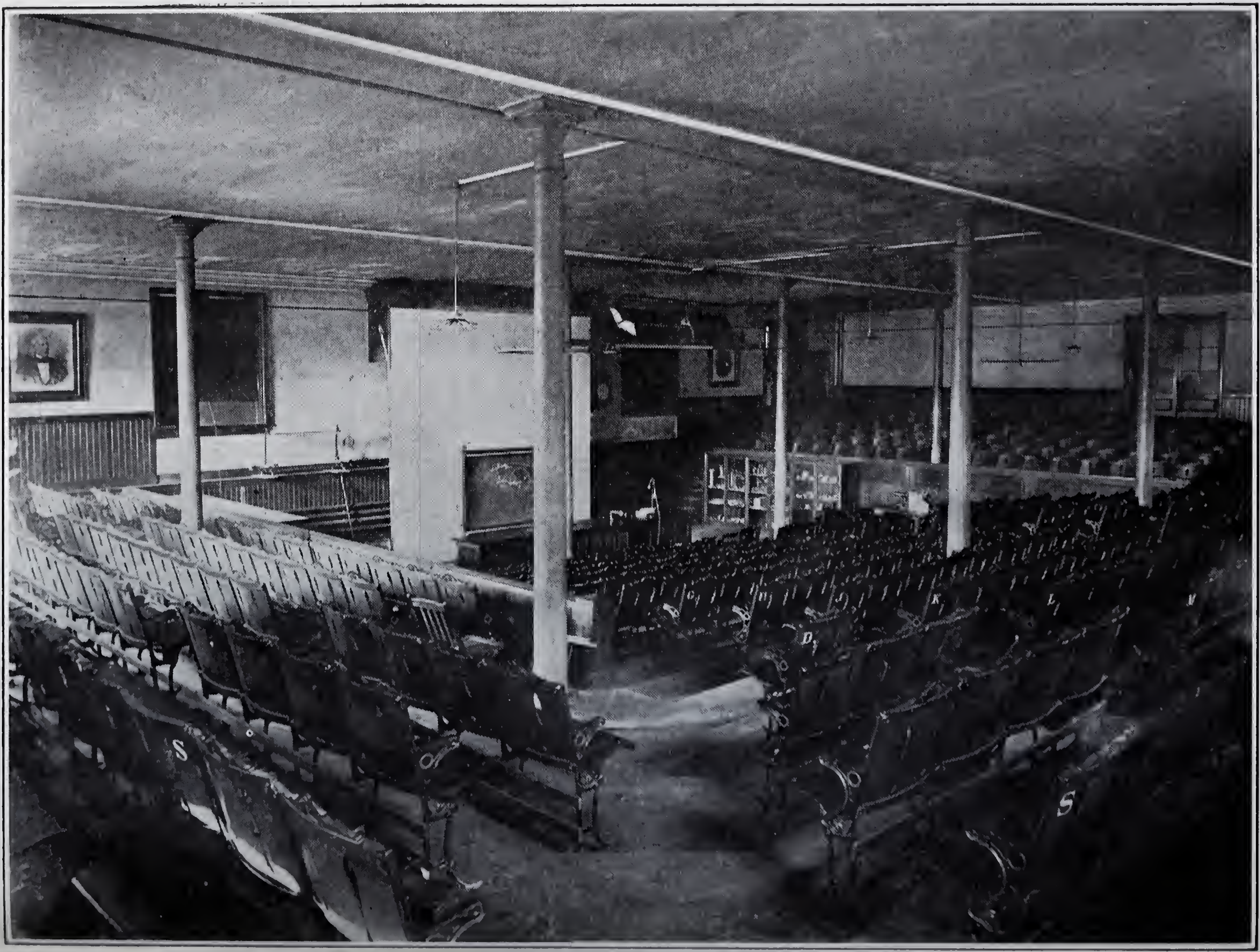
S. P. Byrnes
Thomas Darlington
Harry Gehris, Jr.
Frederic Goodwin Kennedy
F. S. Clouse
Spencer Manning Gowdy
Joseph Cusworth
William Knabe
John A. Meunier

GEOLOGY 1.

Morrell G. Biernbaum
Samuel G. Gordon
Frederic Goodwin Kennedy
Robert Rosenbaum
Edward A. Carroll
Herbert H. Haas
William Knabe
H. W. Trudell



Museum



REGULAR LECTURES

SESSION OF 1912–1913.

ENGINEERING 2.

PROFESSOR SAMUEL T. WAGNER.

Civil Engineering Structures.

1. Friday, September 6.
   Foundations on Land. Designing the Footing. Preparation of the Bed.
2. Friday, September 13.
   Foundations on Land and Water. Foundations on Piles. Coffer Dams.
3. Friday, September 20.
   Foundations in Water. Open Caisson Process. Dredging through Wells. Pneumatic Caissons.
4. Friday, September 27.
   Masonry Construction. Stone Cutting. Preparation of Surfaces. Stone Masonry. Parts of a Wall.
5. Friday, October 4.
   Masonry Construction (Concluded). Ashlar. Rubble. Concrete. Brick Masonry. Retaining Walls, Piers, Etc.

6. Friday, October 11.
   Framing in Wood and Steel. Wood Framing. Iron and Steel Framing. Joints. Rivets. Pins.
7. Friday, October 18.
   Bridges. Definitions. Classification. History.
8. Friday, October 25.
   Bridges (Continued). History (Continued). Beam Bridges.
9. Friday, November 1.
   Bridges (Continued). Plate Girders. Trusses.
10. Friday, November 8.
    Bridges (Continued). Trusses (Continued). Classification. Design of Tension and Compression Members.
11. Friday, November 15.
    Bridges (Continued). Trusses (Concluded). Details and Methods of Erection. Cantilevers.
12. Friday, November 22.
    Bridges (Continued). Suspension. Tubular. Arches (a) Stone; (b) Steel.
13. Friday, November 29.
    Bridges (Concluded). Movable Bridges. Viaducts.
14. Friday, December 6.
    Roofs. Types of Trusses. Special Designs for Train Sheds.
15. Friday, December 13.
    Details of Construction. Rivets, Riveted Work, Pins, Forging Details. Bridge Floors (a) Railroad; (b) Highway.

16. Friday, December 20.
Buildings. Design of Buildings of Wood, Steel, Reinforced Concrete, General Building Construction.

ZOÖLOGY 2.

PROFESSOR SPENCER TROTTER.

The Invertebrate Animals.

1. Monday, October 7.
The Ocean World. Primitive Life and Its Environment. The Plankton. The Nekton. The Benthos. Origin of Forms. The Continental Shelf.
2. Monday, October 14.
The Phyla. Consideration of the Principles of Classification. Relations to Geological History.
3. Monday, October 21.
The Protozoa. Marine and Freshwater Forms. The Rhizopoda. The Mastigophora. The Infusoria. The Sporozoa.
4. Monday, October 28.
Sponge, Polyp and *Medusa.* The Cœlenterate Type. Study of a Simple Sponge. Sponge Colonies. Law of the Division of Labor. Study of a Simple Polyp. The Medusa. Alternation of Generations. Individual and Organ. The Reef-building Corals. The Ctenophora. Stinging Cells.

5. Monday, November 4.
   Worms. Symmetry of Animal Body. Flat Worms. Life History of Tape Worm. Liver Fluke. Parasitism. Round Worms. Life History of Trichina. Earthworms and Leeches. Metamerism. Outlying Groups. Brachiopods. Polyzoa and Rotifers.
6. Monday, November 11.
   The Echinoderms. Study of a Starfish. The Sea Urchin. Holothurians and Crinoids. Radial Symmetry. Life Histories and Habits of Various Forms.
7. Monday, November 18.
   The Crustacea. Segments and Appendages. Study of Lobster. Life and Habits of Various Forms.
8. Monday, November 25.
   Insects. General Structure. Metamorphosis. Relation to Vegetation. Review of the Orders. Economic Relations of Various Forms.
9. Monday, December 2.
   The Mollusca. Study of a Clam. Review of the Orders. Life Histories and Habits of Various Forms.
10. Monday, December 9.
   The Primitive Chordata. Tunicates. Balanoglossus. Ancestry of Vertebrates. Concluding Remarks on Course.

ORGANIC CHEMISTRY 4.

PROFESSOR CHARLES H. LaWALL.

Proteins, Alkaloids and Other Nitrogenous Compounds.

1. Wednesday, September 11.
   Proteins. General Characteristics and Classification.
2. Wednesday, September 18.
   Consideration of the More Important Proteins. Egg Albumin. Glutin. Gelatin. Casein.
3. Wednesday, September 25.
   Action of Enzymes and Other Decomposing Influences Upon Proteins. Digestion Experiments.
4. Wednesday, October 2.
   Derivatives of Proteins. Metaproteins. Proteoses. Peptones.
5. Wednesday, October 9.
   Miscellaneous Nitrogenous Compounds. Amins. Amids. Cyanogen Compounds. Urea. Uric Acid. Creatin.
6. Wednesday, October 16.
   Alkaloids. Piperin. Coniin. Pilocarpin. Nicotin, Etc.
   The Tropin Group of Alkaloids. Atropin. Hyoscyamin. Hyoscin. Cocain. Pelletierin.
8. Wednesday, October 30.
   The Quinolin Group of Alkaloids. Quinin and Other Cinchona Alkaloids. Strychnin. Veratrin.

The Isoquinolin Group of Alkaloids. Morphin. Codein and Other Opium Alkaloids. Hydrastin.

9. Wednesday, November 6.
   Artificial Alkaloids. Apomorphin. Homatropin. Hydrastinin. Heroin.
   Miscellaneous Alkaloids. Caffein.
10. Wednesday, November 13.
    Ptomains and Leucomains. Toxins and Toxalbumins.

PHYSICAL CHEMISTRY 2.

PROFESSOR DAVID WILBUR HORN.

Introduction to Electro-chemistry.

1. Wednesday, November 20.
   Historical. The Voltaic Couple. Primary Cells. Polarization.
2. Wednesday, November 27.
   Quantitative Relations. Faraday's Laws. Ohm's Law. Measurement of Resistance.
3. Wednesday, December 4.
   Electrolytic Dissociation. The Migration of Ions. The Tension Series. Secondary Reactions at Electrodes.
4. Wednesday, December 11.
   Practical Applications. Electrolysis. Electroplating. The Storage Battery.
5. Wednesday, December 18.
   Electro-metallurgy. Sodium. Aluminum. Iron.

BOTANY 2.

PROFESSOR SAMUEL C. SCHMUCKER.

Plant Evolution.

1. Monday, January 6.

   The Earliest Plants. Algæ. The Cell. One-celled Plants. Colonies of Cells: As Filaments; as Thalli. The Beginnings of Reproduction.

2. Monday, January 13.

   Lowly Degenerates. Fungi. The Bacteria. Moulds and Rusts. Mushrooms. Parasites and Saprophytes.

3. Monday, January 20.

   Early Coöperation. Lichens. Their Appearance and Habits: Crusted, Leafy and Shrubby Lichens. Coöperation of Algæ and Fungi. Symbiosis.

4. Monday, January 27.

   Taking to the Land. Liverworts and Mosses. Plants of the Damp. Spreading Over the Ground. The Sperm Sac and the Egg Flask.

5. Monday, February 3.

   The Double Life. The Fern Plate: The Sexual Generation. The Fern Plant: The Asexual Generation. Spore Production and Dissemination.

6. Monday, February 10.

   The *Fern Allies.* Horsetails and Groundpines. The Two Kinds of Spores. The Carboniferous Period and Its Forests. Left-over Plants.

7. Monday, February 17.

   The Earliest Seed Plants. Gymnosperms. The Cycads and Their Flowering. The Arrival of the Cone-bearers. The Lumber Industry.

8. Monday, February 24.

   The Higher Seed Plants. Angiosperms. The Evolution of the Flower. Its Spore Leaves. Stamens and Pistils. Pollination and Fertilization. The Advantage of the Seed Habit.

9. Monday, March 3.

   Nearing the Top. Monocotyledons. The Grasses and Their Work. Palms. From Lilies to Orchids.

10. Monday, March 10.

    The Crown of the Plant World. Dicotyledons. The Simpler, Wind-Pollinated Flowers. Insect Pollination. The Versatility of the Group.

PHYSICS 3.

PROFESSOR LESLIE B. SEELY.

Light.

1. Friday, January 3.
   Historical. History of the Development of the Theory of Light. The Impingement Theory of Light. Newton. Huygens. The Ether Wave Theory. Galileo. Rumford.
2. Friday, January 10.
   Propagation of Light. Light travels in Straight Lines. Intensity of Light. Law of Inverse Squares. Shadows.
3. Friday, January 17.
   Propagation of Light (Continued). Brightness and Illumination. Photometry. Speed of Light.
4. Friday, January 24.
   Reflection. Law of Reflection. Mirrors and Diffusing Surfaces. Plane Mirrors.
5. Friday, January 31.
   Reflection (Continued). Curved Mirrors. Principal Focus, Conjugate Foci and Center of Curvature. Images: Real and Apparent.
6. Friday, February 7.
   Refraction. Passage of Light to Denser and to Rarer Media. Index of Refraction. The Angle of Total Reflection.
7. Friday, February 14.
   Refraction (Continued). Lenses and Prisms. Principal Focus and Conjugate Foci of Lenses. Images by Lenses.

8. Friday, February 21.
Dispersion. Composition of White Light. Complementary Colors. Pigments.

9. Friday, February 28.
Color Phenomena. Coloration by Absorption and Reflection. Opalescence. Phosphorescence. Fluorescence.

10. Friday, March 7.
Spectra. The Solar Spectrum. Fraunhofer's Lines. Bright Line and Dark Line Spectra. The Spectroscope.

11. Friday, March 14.
Spectra (Continued). Infra-red and Ultra-violet Light. Composition of the Sun's Energy. Artificial Lights and Sunlight.

12. Friday, March 21.
Interference and Polarization. Description of Interference Phenomena. Polarization.

13. Friday, April 4.
Optical Instruments. Magnifying Glass. Compound Microscope. Telescope.

14. Friday, April 11.
Optical Instruments (Continued). The Projecting Lantern. Opaque Projection. Stereoscope. Binocular Vision.

15. Friday, April 18.
Photography. The Camera Obscura. The Photographic Process. Lens Correction. Color Photography.

16. Friday, April 25.
The Eye and Common Defects of Vision. Near-sightedness and Far-sightedness. Astigmatism. Color Blindness.

GEOLOGY 2.

DR. EDGAR T. WHERRY.

Structural and Economic Geology.

1. Wednesday, January 8.
   The Elements of Mineralogy.
2. Wednesday, January 15.
   The Rock Making Minerals.
3. Wednesday January 22.
   The Igneous Rocks.
4. Wednesday, January 29.
   The Structures of Igneous Rocks.
5. Wednesday, February 5.
   The Sedimentary Rocks.
6. Wednesday, February 12.
   The Structures of Sedimentary Rocks.
7. Wednesday, February 19.
   The Structures of Sedimentary Rocks (Continued).
8. Wednesday, February 26.
   Metamorphism and the Resulting Structures.
9. Wednesday, March 5.
   The Minerals of Economic Importance.
10. Wednesday, March 12.
    Coal and Petroleum.
11. Wednesday, March 19.
    Building Stones and Structural Materials.
12. Wednesday, March 26.
    The Minor Minerals, Salt, Asbestos, Etc.

13. Wednesday, April 2.
    The Origin of Ore Bodies.
14. Wednesday, April 9.
    Iron Ores.
15. Wednesday, April 16.
    The Ores of Copper, Lead and Zinc.
16. Wednesday, April 23.
    Gold and Silver and the Rare Metals.

PUBLICATIONS OF THE INSTITUTE.

Vol. 1.—Explorations on the West Coast of Florida and in the Okeechobee Wilderness. Angelo Heilprin.

Vol. 2.—Report on Fresh-water Sponges Collected in Florida. Edward Potts.

Notice of Some Fossil Human Bones. Joseph Leidy.

Description of Mammalian Remains from Rock Crevice in Florida. Joseph Leidy.

Description of Vertebrate Remains from Peace Creek, Florida. Joseph Leidy.

Notice of Some Mammalian Remains from Salt Mine of Petite Anse, Louisiana. Joseph Leidy.

On Platygonus, an Extinct Genus Allied to the Peccaries. Joseph Leidy.

Remarks on the Nature of Organic Species. Joseph Leidy.

Vol. 3.—Parts 1, 2, 3, 4, 5, 6.—Contributions to the Tertiary Fauna of Florida. William H. Dall.

Vol. 4.—Fossil Vertebrates from the Alachua Clays, Florida. Joseph Leidy.

Vol. 5.—Study of Hawaiian Skulls.
Harrison Allen.

Notes on the Palæontological Publications of Prof. Wm. Wagner.
William H. Dall.

Vol. 6.—Selenodont Artiodactyls of the Uinta Eocene. W. B. Scott.

Vol. 7.—Contributions to the Mineralogy of the Newark Group in Pennsylvania.
Edgar T. Wherry.

A Comparative Study of the Radio-Active Minerals in the Collection of the Wagner Free Institute of Science.
Carl Boyer and Edgar T. Wherry.